

FIG. 2

RECEIVE A SELECTION OF A RESOURCE REPRESENTATION IN A NETWORK ENVIRONMENT THAT REPRESENTS A RESOURCE TO WHICH A MANAGEMENT ACTION IS TO BE APPLIED

201

APPLY A SERIES OF RESOURCE TRAVERSAL FUNCTIONS TO A REPOSITORY CONTAINING OBJECTS REPRESENTATIVE OF NETWORK RESOURCES IN THE NETWORK ENVIRONMENT. THE TRAVERSAL FUNCTIONS IDENTIFYING A SET OF ACTION-AFFECTED RESOURCES IN THE NETWORK ENVIRONMENT EXISTING ALONG A SET OF RELATIONSHIP PATHS EXTENDING TO AT LEAST ONE STORAGE DEVICE THAT HAVE A CURRENT ALLOCATION RELATIONSHIP TO THE SELECTED RESOURCE

IDENTIFY A COLLECTIVE SET OF ACTION-AFFECTED RESOURCES THAT RELATE TO OPERATION OF THE SELECTED RESOURCE AND INCLUDE THE SET OF DOWNWARD RESOURCES. THE SET OF UPWARD RESOURCES AND THE SET OF CLOSURE RESOURCES ON DATA FLOW PATHS WITHIN THE NETWORK ENVIRONMENT

> 203 APPLY GOING DOWN FUNCTION (FIGURE 4)

204 APPLY GOING UP FUNCTION (FIGURE 6)

205 **APPLY CLOSURE FUNCTION (FIGURE 8)**

206
PRESENT A REPRESENTATION OF THE SET OF ACTION AFFECTED RESOURCES IN THE NETWORK ENVIRONMENT TO A USER OF THE MANAGEMENT APPLICATION. THE REPRESENTATION OF THE SET OF ACTION AFFECTED RESOURCES INFORMING THE USER OF RESOURCES WITHIN THE STORAGE AREA NETWORK THAT ARE CURRENTLY IN AN FUNCTIONAL RELATIONSHIP WITH THE SELECTED RESOURCE TO WHICH A MANAGEMENT ACTION IS TO BE APPLIED AND THAT MAY BE AFFECTED IF THE MANAGEMENT ACTION IS TO BE APPLIED TO THE SELECTED RESOURCE

RECEIVE A FINAL SELECTION OF RESOURCE REPRESENTATIONS IN THE NETWORK ENVIRONMENT THAT REPRESENT RESOURCES TO WHICH A MANAGEMENT ACTION IS TO BE APPLIED, THE FINAL SELECTION BEING MADE FROM THE COLLECTIVE SET OF ACTION-AFFECTED RESOURCES THAT RELATE TO OPERATION OF THE SELECTED RESOURCE

> REPEAT IF CLOSURE RESOURCES SELECTED

208

APPLY THE MANAGEMENT ACTION TO THE FINAL SELECTION OF RESOURCE REPRESENTATIONS

APPLY A GOING DOWN FUNCTION TO THE REPOSITORY CONTAINING OBJECTS
REPRESENTATIVE OF RESOURCES TO IDENTIFY A SET OF DOWNWARD RESOURCES IN THE
NETWORK ENVIRONMENT THAT HAVE A DOWNWARD ALLOCATION RELATIONSHIP TO THE
SELECTED RESOURCE, THE DOWNWARD ALLOCATION RELATIONSHIP INDICATING
RESOURCES THAT THE SELECTED RESOURCE DEPENDS UPON AND THAT ARE IN
OPERATIONAL USE DURING ACCESS TO DATA BY THE SELECTED RESOURCE ON A
DOWNWARD ALLOCATION PATH BEGINNING AT THE SELECTED RESOURCE AND EXTENDING
DOWNWARD THROUGH THE NETWORK ENVIRONMENT AND TERMINATING AT PHYSICAL
STORAGE DEVICES THAT STORE THE DATA ACCESSED BY THE SELECTED RESOURCE

401

TRAVERSE OPERATIONAL RELATIONSHIPS OF HOST OBJECTS, BEGINNING AT THE SELECTED RESOURCE HOST OBJECT IN THE REPOSITORY, TO IDENTIFY SUCCESSIVE HOST AND STORAGE OBJECTS LINKED IN AN OPERATIONAL PATH ENDING AT AT LEAST ONE STORAGE OBJECT THAT IS A STORAGE DEVICE, THE GOING DOWN FUNCTION THUS IDENTIFYING EACH HOST AND STORAGE RESOURCE ALLOCATED FOR USE DURING ACCESS TO DATA IN THE STORAGE DEVICE OBJECT BY THE SELECTED HOST OBJECT RESOURCE

402

IDENTIFY EXISTENCE OF A SET OF REPLICATED RESOURCES IN THE SET OF DOWNWARD RESOURCES, THE SET OF REPLICATED RESOURCES INCLUDING A REPLICATED INSTANCE OF A DETECTED REPLICATED RESOURCE AND ANY RESOURCES OPERATIONALLY RELATED TO THE REPLICATED INSTANCE OF THE DETECTED REPLICATED RESOURCE

403

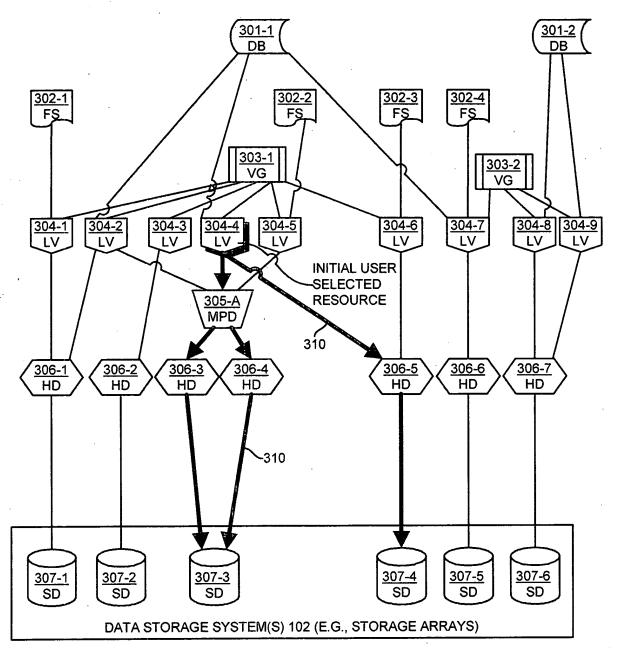
PROMPT A USER TO DETERMINE IF THE SET OF REPLICATED RESOURCES ARE TO BE INCLUDED IN THE APPLICATION OF THE SERIES OF RESOURCE TRAVERSAL FUNCTIONS

404

RECEIVE A REPLICATION RESPONSE FROM THE USER

405

IF THE REPLICATION RESPONSE FROM THE USER INDICATES THE SET OF REPLICATED RESOURCES ARE TO BE INCLUDED IN THE APPLICATION OF THE SERIES OF RESOURCE TRAVERSAL FUNCTIONS, THEN APPLY THE SERIES OF RESOURCE TRAVERSAL FUNCTIONS TO THE SET OF REPLICATED RESOURCES



GOING DOWN EXAMPLE

FIG. 5

APPLY A GOING UP FUNCTION TO THE REPOSITORY CONTAINING OBJECTS
REPRESENTATIVE OF RESOURCES TO IDENTIFY A SET OF UPWARD RESOURCES IN THE
NETWORK ENVIRONMENT THAT HAVE AN UPWARD ALLOCATION RELATIONSHIP TO THE
SELECTED RESOURCE, THE UPWARD ALLOCATION RELATIONSHIP INDICATING RESOURCES
THAT DEPEND UPON OPERATIONAL USE OF RESOURCES IN THE SET OF DOWNWARD
RESOURCES BUT THAT EXIST ON AN UPWARD ALLOCATION PATH BEGINNING AT THE
PHYSICAL STORAGE DEVICES THAT STORE THE DATA ACCESSED BY THE SELECTED
RESOURCE AS IDENTIFIED IN THE SET OF DOWNWARD RESOURCES AND EXTENDING
UPWARD THROUGH THE NETWORK TO TOP-LEVEL RESOURCES COMPRISING AT LEAST ONE
HOST DEVICE RESOURCE OTHER THAN HOST DEVICE RESOURCES IDENTIFIED IN THE SET
OF DOWNWARD RESOURCES

421

IDENTIFY HOST OBJECTS IN THE REPOSITORY THAT ARE:

I) OPERATIONALLY LINKED TO EACH HOST AND STORAGE OBJECT IDENTIFIED DURING APPLICATION OF THE GOING DOWN FUNCTION BUT IN A DIRECTION UPWARDS IN THE HIERARCHICALLY ARRANGED ORDER OF OBJECTS IN THE REPOSITORY: AND

II) THAT ARE NOT DIRECTLY WITHIN THE DATA FLOW PATH IDENTIFIED IN THE GOING DOWN FUNCTION FROM THE SELECTED RESOURCE HOST OBJECT TO THE STORAGE DEVICE OBJECT, THE GOING UP FUNCTION THUS IDENTIFYING ADDITIONAL OBJECTS REPRESENTING RESOURCES IN THE NETWORK ENVIRONMENT THAT MAY BE AFFECTED BY THE MANAGEMENT ACTION UPON THE SELECTED RESOURCE

422

DETERMINE IF ALTERNATE HOST RESOURCES EXIST, THE ALTERNATE HOST RESOURCES INCLUDING ANY HOST DEVICE RESOURCES OF HOST COMPUTER SYSTEMS OTHER THAN A HOST COMPUTER SYSTEM CONTAINING THE SELECTED RESOURCE SHARE DATA ALLOCATED ON ANY STORAGE DEVICE RESOURCES IDENTIFIED DURING APPLICATION OF THE GOING DOWN FUNCTION FOR THE SELECTED RESOURCE

423

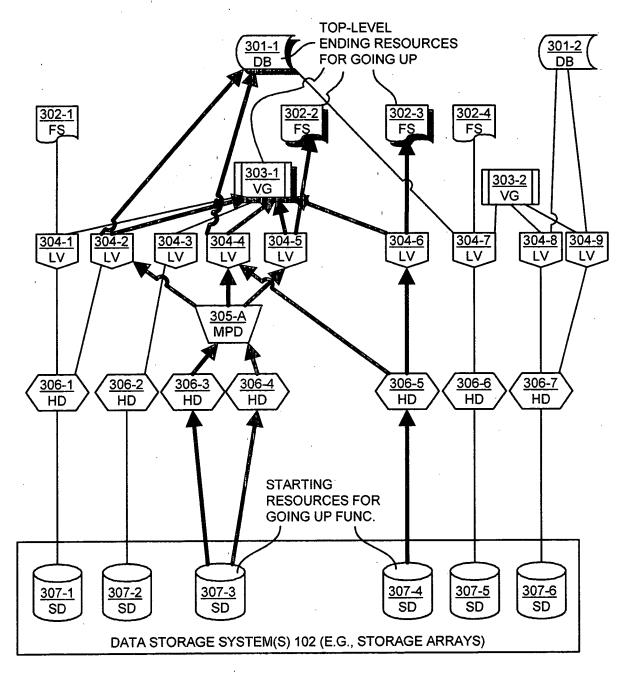
PROMPT A USER TO DETERMINE IF THE ALTERNATE HOST RESOURCES ARE TO BE INCLUDED IN THE APPLICATION OF THE GOING UP AND CLOSURE RESOURCE TRAVERSAL FUNCTIONS

424

RECEIVE A MULTIPLE-HOST RESPONSE FROM THE USER

425

IF THE MULTIPLE-HOST RESPONSE FROM THE USER INDICATES THE ALTERNATE HOST RESOURCES ARE TO BE INCLUDED IN THE APPLICATION OF THE GOING UP AND CLOSURE RESOURCE TRAVERSAL FUNCTIONS, THEN INCLUDE THE ALTERNATE HOST RESOURCES IN APPLICATION OF THE GOING UP AND CLOSURE RESOURCE TRAVERSAL FUNCTIONS



GOING UP EXAMPLE

FIG. 7

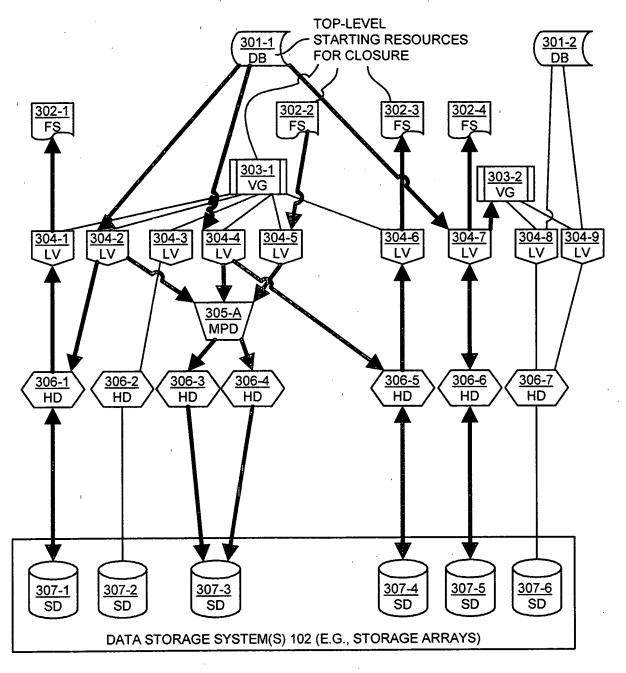
APPLY A CLOSURE FUNCTION TO THE REPOSITORY CONTAINING OBJECTS
REPRESENTATIVE OF RESOURCES TO IDENTIFY A SET OF CLOSURE RESOURCES IN
THE NETWORK ENVIRONMENT THAT HAVE AN INDIRECT RELATIONSHIP TO ANY
RESOURCES IN THE SET OF UPWARD AND DOWNWARD RESOURCES RESOURCES, THE
SET OF CLOSURE RESOURCES INDICATING RESOURCES THAT WOULD BE AFFECTED
BY A CHANGE MADE TO OPERATION OF RESOURCES

441

IDENTIFY CLOSURE OBJECTS IN THE REPOSITORY BY REPEATEDLY (E.G. RECURSIVELY) RE-APPLYING AN OPERATION OF THE GOING DOWN FUNCTION AND GOING UP FUNCTION TO THE ADDITIONAL OBJECTS REPRESENTING RESOURCES IN THE NETWORK ENVIRONMENT THAT MAY BE AFFECTED BY THE MANAGEMENT ACTION UPON THE SELECTED RESOURCE THAT WERE IDENTIFIED DURING OPERATION OF THE GOING UP FUNCTION

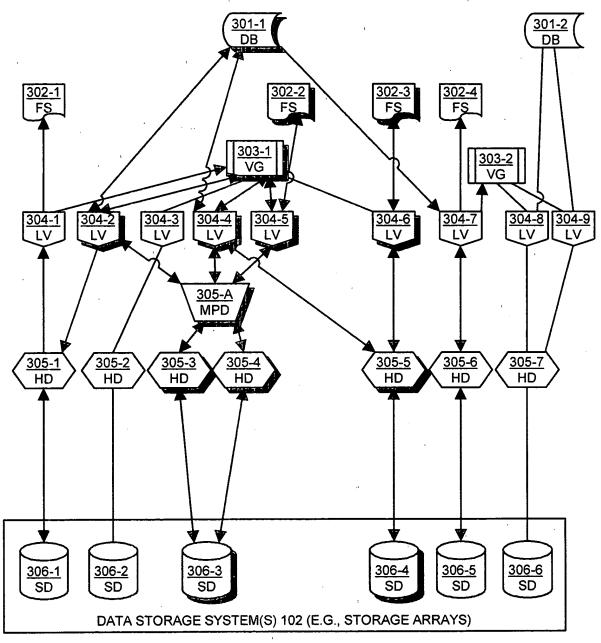
CLOSURE FUNCTION

FIG. 8



CLOSURE EXAMPLE

FIG. 9



COLLECTIVE SET OF ACTION-AFFECTED RESOURCES
(I.E., ALL RESOURCES WITH AN ARROWHEAD)
NOTE: SHADED ARE AUTOMATICALLY INCLUDED IN RESOURCE TO WHICH ACTION WILL BE APPLIED, NON-SHADED ARE CLOSURE RESOURCES THAT THE USER CAN SELECT TO ADD

207 RECEIVE A FINAL SELECTION OF RESOURCE REPRESENTATIONS

450

DETERMINE IF ANY RESOURCES SELECTED FROM THE FINAL SELECTION OF RESOURCE REPRESENTATIONS IN THE NETWORK ENVIRONMENT ARE RESOURCES IDENTIFIED WITHIN THE SET OF CLOSURE RESOURCES IN THE NETWORK ENVIRONMENT, AND IF SO, PERFORMING THE OPERATIONS OF STEPS 451 AND 452

451

RE-APPLY THE SERIES OF RESOURCE TRAVERSAL FUNCTIONS INCLUDING THE GOING DOWN FUNCTION, THE GOING UP FUNCTION AND THE CLOSURE FUNCTION TO ANY SELECTED TOP-LEVEL ANY RESOURCES SELECTED FROM THE FINAL SELECTION OF RESOURCE REPRESENTATIONS IN THE NETWORK ENVIRONMENT ARE RESOURCES IDENTIFIED WITHIN THE SET OF CLOSURE RESOURCES

452

RE-SELECT A FINAL SELECTION OF RESOURCE REPRESENTATIONS IN THE NETWORK ENVIRONMENT THAT REPRESENT RESOURCES TO WHICH A MANAGEMENT ACTION IS TO BE APPLIED

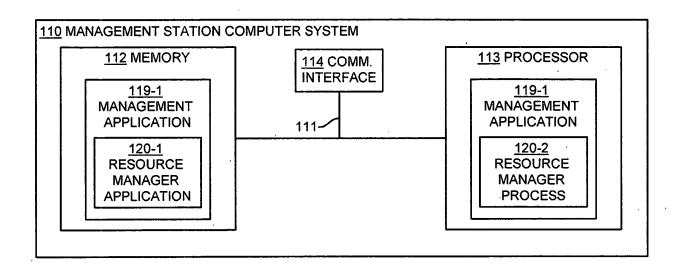


FIG. 12